

## CALIFORNIA ENERGY COMMISSION

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NOTIFICATION OF APPROVAL  
OF STANDARD U-FACTOR DATA  
FOR WOOD FRAMED ATTIC ROOFS  
WITH INSULATION  
ONLY BETWEEN THE CEILING JOISTS

As part of the adoption of the 2005 Building Energy Efficiency Standards, the California Energy Commission adopted Joint Appendix IV, which contains standard U-factor, C-factor and Thermal Mass data for roof, wall and floor construction assemblies (see page IV-1 of the Joint Appendices at: [http://www.energy.ca.gov/title24/2005standards/2004-10-06\\_400-03-001-JAF.PDF](http://www.energy.ca.gov/title24/2005standards/2004-10-06_400-03-001-JAF.PDF)). The data in Joint Appendix IV must be used for all residential and nonresidential compliance approaches, including the mandatory requirements, prescriptive envelope component approach, prescriptive overall envelope approach and performance approach for nonresidential, high-rise residential and hotel/motel buildings; and the mandatory requirements, and prescriptive and performance approaches for low-rise residential buildings.

If a construction assembly is not adequately represented in Joint Appendix IV, an applicant may request approval by the Energy Commission's Executive Director for different data for that construction assembly. The approval by the Executive Director is based on the technical justification submitted by the applicant. Approved standard data for the construction assembly will be published as an addendum to Joint Appendix IV for use in all compliance approaches.

This Notification of Approval of Standard U-factor Data, for Wood-Framed Attic Roofs With Insulation Only Between the Ceiling Joists, authorizes the use of the data shown in the attached Table IV.1c, including the limitations in the description following the table. Table IV.1c is now officially added as an addendum to Joint Appendix IV to replace the existing Table IV.1 and Table IV.1a.

Approved by:

  
MELISSA JONES  
Executive Director

Dated

6/2/09

## IV.2 Roofs and Ceilings

Table IV.1c – U-factors of Wood Framed Attic Roofs  
With Insulation Between The Ceiling Joists<sup>1</sup>

Truss Spacing	R-value of Attic Insulation		Rated R-value of Continuous Insulation <sup>2,3</sup>							
			None A	R-2 B	R-4 C	R-6 D	R-7 E	R-8 F	R-10 G	R-14 H
16 in. OC	None	1	0.300	0.186	0.135	0.106	0.096	0.087	0.074	0.057
	R-11	2	0.079	0.067	0.059	0.053	0.050	0.047	0.043	0.037
	R-13	3	0.071	0.061	0.054	0.049	0.046	0.044	0.040	0.035
	R-19	4	0.054	0.049	0.045	0.041	0.039	0.038	0.035	0.031
	R-22	5	0.050	0.045	0.041	0.038	0.037	0.036	0.033	0.029
	R-25	6	0.046	0.042	0.039	0.036	0.035	0.034	0.032	0.028
	R-30	7	0.041	0.038	0.035	0.033	0.032	0.031	0.029	0.026
	R-38	8	0.036	0.034	0.032	0.030	0.029	0.028	0.027	0.024
	R-44	8a	0.034	0.031	0.030	0.028	0.027	0.026	0.025	0.023
	R-49	9	0.032	0.030	0.028	0.027	0.026	0.025	0.024	0.022
24 in. OC	R-60	10	0.029	0.027	0.026	0.025	0.024	0.023	0.022	0.021
	None	11	0.305	0.188	0.136	0.107	0.097	0.088	0.075	0.058
	R-11	12	0.076	0.066	0.058	0.052	0.049	0.047	0.043	0.036
	R-13	13	0.068	0.059	0.053	0.048	0.045	0.043	0.040	0.034
	R-19	14	0.051	0.046	0.043	0.039	0.038	0.036	0.034	0.030
	R-22	15	0.046	0.042	0.039	0.036	0.035	0.034	0.032	0.028
	R-25	16	0.043	0.039	0.036	0.034	0.033	0.032	0.030	0.027
	R-30	17	0.038	0.035	0.033	0.031	0.030	0.029	0.027	0.025
	R-38	18	0.032	0.030	0.029	0.027	0.026	0.026	0.024	0.022
	R-44	18a	0.030	0.028	0.026	0.025	0.025	0.024	0.023	0.021
	R-49	19	0.028	0.026	0.025	0.024	0.023	0.023	0.022	0.020
	R-60	20	0.025	0.024	0.01523	0.022	0.021	0.021	0.020	0.018

### Notes:

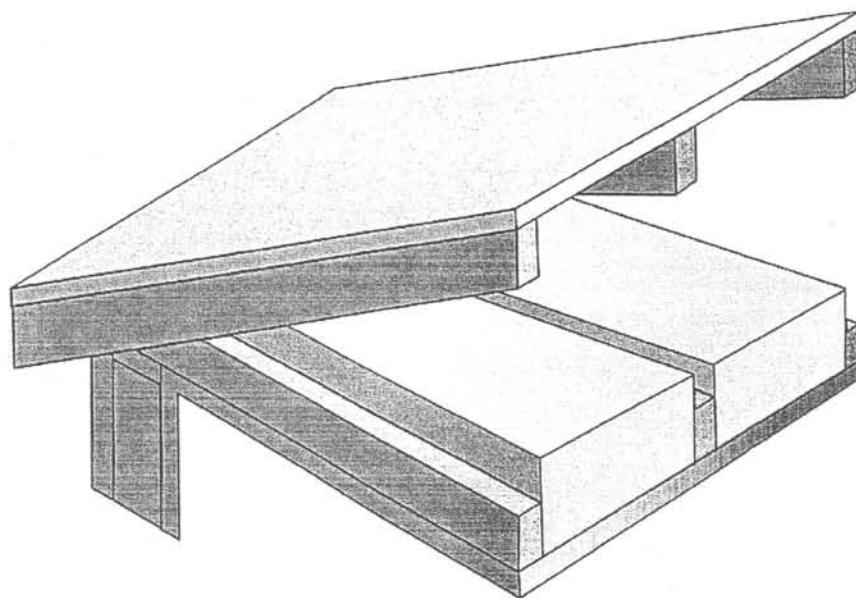
1. Joint Appendices IV, Table IV.1b must be used only if wood framed attic roofs assemblies have insulation which fills the cavity and completely covers the ceiling joists.
2. Continuous insulation shall be located at the ceiling, below the bottom joist of the truss and be uninterrupted by framing.
3. In climate zones 1 and 16, the insulating R-value of continuous insulation materials installed above the roof waterproof membrane shall be multiplied times 0.8 before choosing the table column for determining assembly U-factor.

Table IV.1c shall be used only when insulation is placed between the ceiling joists of wood framed attic roofs. If insulation is placed over and completely covers the ceiling joists, then Joint Appendices IV, Table IV.1b shall be used. This table replaces the existing Table IV.1 and Table IV.1a. This table contains thermal performance data (U-factors) for wood framed attics where the ceiling provides the air barrier and the attic is ventilated. This table shall not be used for cases where insulation is located at the underside of the roof. Wood trusses are the most common construction for low-rise residential buildings and for Type V nonresidential buildings. While the sketch shows a truss system with a flat ceiling, the data in this table must be used for scissor trusses and other non-flat trusses. If the bottom of the ceiling is not flat, then the slope shall not exceed 4:12 if blown insulation is used. This table may also be used with composite trusses that have a wood top and bottom joist and metal struts connecting them.

For the majority of cases, values will be selected from column A of this table. Column A shall be used for the common situation where insulation is placed directly over the ceiling (and tapered at the edges) between, but not completely covering, the ceiling joists. Builders or designers may increase thermal

performance by adding a continuous insulation layer at the ceiling below the ceiling joists. The continuous insulation is typically a rigid polystyrene or polyisocyanurate foam insulation.

When this table is used, the R-value of continuous insulation shall be equal to or greater than the R-value published in the continuous insulation columns (columns B through H). For example, if the insulation is R-3, the R-2 column shall be used. No interpolation is permitted when data from the table is selected. The California Energy Commission approved ACMs, including those used for prescriptive compliance, may be used to accurately account for any amount of continuous insulation, or for unusual construction assemblies using Equation IV-1 and Equation IV-2.



*Figure IV.1c – Wood Framed Attic Roofs with insulation between the ceiling joists and does not cover the ceiling Joists*

**Assumptions.** The data from Table IV.1c are calculated using the parallel path method documented in the 2001 ASHRAE Fundamentals. These calculations assume an exterior air film of R-0.17, asphalt shingles of R-0.44 (AR02), building paper of R-0.06 (BP01), 1/2" of plywood of R-0.63 (PW03), an attic air space (greater than 3.5") with a R-0.80, 1/2" gypsum board (GP01) of R-0.45, and an interior air film (heat flow up) of R-0.61. Wood 2x4 framing is assumed at the ceiling level. Batt insulation is assumed between the framing members and no insulation over the framing. The framing percentage is assumed to be 10% for 16 in. OC and 7% for 24 in. OC. 7.25% of the attic insulation above the framing members is assumed to be at half depth, due to decreased depth of insulation at the eaves.